Quiz 2

Be sure to show work clearly .

(1) Given the points P(3, -2, 0) and Q(1,4,7) *(4 points)*

a). Find the distance between P and Q. $\sqrt{89}$

b) Find the vector $\overrightarrow{PQ}$ $\langle -2, 6, 7 \rangle$

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(2) Given the vectors **a** = $\langle -5,1,2 \rangle$ and **b** = $\langle -1,0,4 \rangle$, find

a) the angle between **a** and **b** *(2 points)*

(Note: In this class, exact answers should always be given unless otherwise stated; that is don't use your calculator to get an approximation)

$$\cos\theta = \frac{\vec{a}\cdot\vec{b}}{\|\vec{a}\|\|\vec{b}\|} = \frac{13}{\sqrt{30}\sqrt{17}}$$

$\theta = \cos^{-1}\left(\frac{13}{\sqrt{510}}\right)$

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b) **a** X **b** *(10 points)*

$$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -5 & 1 & 2 \\ -1 & 0 & 4 \end{vmatrix} = \langle 4, 18, 1 \rangle$$

Check your answer by showing it is orthogonal to both a and b

$\langle 4,18,1 \rangle \cdot \langle -5,1,2 \rangle = 0$

$\langle 4,18,1 \rangle \cdot \langle -1,0,4 \rangle = 0$

Note: $\vec{a} \times \vec{b}$ is always orthogonal to both $\vec{a}$ and $\vec{b}$, so these should be zero. I suggest doing this on all your cross products

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c) $\text{proj}_{\mathbf{a}}\mathbf{b}$ *(2 points)*

$$\text{proj}_{\vec{a}}\vec{b} = \frac{\vec{a}\cdot\vec{b}}{\vec{a}\cdot\vec{a}}\vec{a}$$

$\left\langle \frac{-13}{6}, \frac{13}{30}, \frac{13}{15} \right\rangle$

projection ON $\vec{a}$ is a multiple of $\vec{a}$

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d) a unit vector in the direction of **b** *(2 points)*

$$\vec{u} = \frac{1}{\|\vec{b}\|}\vec{b}$$

$\left\langle -\frac{1}{\sqrt{17}}, 0, \frac{4}{\sqrt{17}} \right\rangle$